R E M A R K S

By this Amendment the specification has been amended to include standard topic headings, claim 21 has been amended to be more specific relative to the condition variable that is determined, claim 22 has been canceled, claim 26 has been revised for clarity, claims 28-41 have been canceled (directed to non-elected inventions), and new claims 42-59 have been added to alternatively define the elected invention (claim 42 corresponds to claim 24 written in independent form, claim 48 corresponds to claim 26 written in independent form, and claim 54 corresponds to claim 27 written in independent form). Entry is requested.

In the outstanding Office Action the examiner has rejected claims 21-27 under 35 U.S.C. 201(b) as being anticipated by Shimoda et al. or Bullis et al.

The inventors assert that these rejections must be withdrawn.

Shimoda et al. disclose a diesel engine including a method of operating an internal combustion diesel engine wherein in a unit desired values of the amount of injection and injection timing of a injection nozzle, of a fuel pressure in a common rail, of an excess air ratio of intake air to be introduced into each cylinder and of a temperature of EGR gas are read from the corresponding maps incorporated in advance in the unit on the basis of an inputted engine speed and an inputted accelerator stepped-on degree. Contrary to the present invention, no condition variable in a cylinder is determined as a function of a crank angle and no

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signal about a cylinder condition is obtained therefrom. Therefore, no actual characteristic values can be determined directly from a cylinder condition. Shimoda et al. also provide that parameters for injection and for exhaust gas recirculation can be varied via a control algorithm in order to match some desired values, but these desired values cannot be related with a condition of a cylinder directly. Characteristic cycle values as mass fraction of injected fuel burned, maximum pressure increase in the cylinder, combustion noise, start of combustion or duration of combustion are not at all mentioned in Shimoda et al. in connection with the control algorithm.

Bullis et al. describe a method and an apparatus for generating start of combustion signals associated with the combustion events in a diesel engine, and for using such signals to control the timing of fuel delivery to the engine. The combustion event is sensed by an electrostatic or optical sensor, and signal conditioning circuitry provides a start-of-combustion signal which is directly and precisely indicative of the time of the onset of combustion.

In the present invention there are at least two characteristic values from a group comprising mass fraction of injected fuel burned, maximum pressure increase in the cylinder, combustion noise, start of combustion and duration of combustion are determined from the cylinder condition signal. Bullis et al. only control the start of combustion, but are silent concerning the other characteristic values.

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According to one aspect of the present invention, a 50% mass fraction of an injected fuel burned is determined as one characteristic value. The position of the 50% mass fraction determines the torque-output of the combustion engine. Therefore varying the position of the 50% mass fraction changes torque output, even if the amount of the injected fuel remains unchanged, because efficiency is dependent on the location of the 50% mass fraction. In the present invention 50% mass fraction is closed-loop-controlled. Without a closed-loop-control of the 50% mass fraction, the efficiency would be reduced at a change of any engine condition parameter. It is well-known to compensate the influence of different engine parameter by a lot of correction functions, which however necessitate very much storage capacities, development efforts and sensors, e.g., a fuel quality sensor for compensating different fuel qualities. The present invention avoids this disadvantages by determining a 50% mass fraction as one characteristic value, wherein the time of fuel injection is adjusted as a correcting variable.
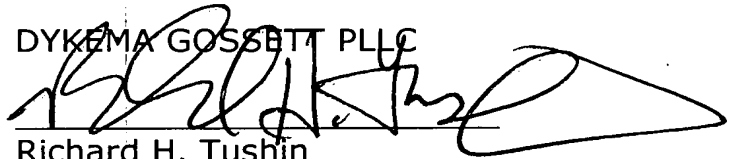
According to another aspect of the present invention a maximum in-cylinder pressure increase is determined as a characteristic cycle value. This has the advantage that the noise emissions can be influenced in a positive manner, even if the engine operation parameters change.

The examiner's prior art rejections should be withdrawn and claims 21-27 and 42-59 allowed.

The additional claims fees should be charged to Account No. 04-2223.

Respectfully submitted,

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